Master Thesis

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The effect of board diversity and independence on IPO underpricing -

An investigation on the Swedish market

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Summary

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Five Key Words – Diversity, Independence, Board characteristics, IPO underpricing, Regression analysis

Purpose – To investigate if board diversity and independence have a relationship with IPO underpricing

Methodology – A quantitative method using Ordinary Least Squares regressions

Theoretical perspectives – Prior papers often suggest that both board diversity and independence is positive for the company and should thus limit the underpricing through signalling

Empirical foundation – The final sample consisted of 188 listings on Nasdaq Stockholm (57) and Nasdaq First North (131), between 2015-01-01 – 2018-12-31

Conclusions – No statistically significant relationship was found between board diversity and IPO underpricing. However, a weakly statistically significant positive relationship was found between *Independence* and *Underpricing*. Lastly, an interaction term for board diversity and independence from company was found.

Abstract

This paper aims to study the effect that board independence and diversity have on IPO underpricing. It is expected that through signalling, these factors might have a negative relationship with underpricing. Listings between 2015-01-01 - 2018-12-31 on the two Swedish stock exchanges Nasdaq Stockholm and Nasdaq First North are investigated and the final sample consisted of 188 observations. The quantitative research methodology was done using an OLS regression. The regression showed no statistical significance for the relationship between board diversity and underpricing. However, a weakly statistically significant positive relationship was found between *Independence* and *Underpricing*. Three interaction terms were created in order to investigate possible relationships between independence and diversity on underpricing. An interaction effect with weak statistical significance was found between *Independence from company* and *Diversity*.

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1. Introduction

One of the most investigated puzzles in corporate finance is the underpricing of initial public offerings (IPOs) (Berk & DeMarzo, 2016). While many researchers have added to the topic of underpricing, few have investigated the effect of board diversity and independence in Sweden. Boulton et al. (2010) found that the average underpricing in Sweden between 2000 - 2004 was below 6 %. In the highlight of recent social debates regarding board diversity and independence, there is dire need for this investigation. Board diversity as form of corporate governance has been a widely debated topic since before the 2000s, as shown by Burton (2008), Mallin (2002) and Mueller (2006) in their studies on this matter. They conclude that focus is directed towards how to align interests of management and shareholders. According to many studies, gender diversity has had a large impact on governance (Adams & Ferreira, 2009; Morrison, 1992). Gender representation in corporate board of directors is an area that has been widely discussed as seen by the amount of studies and legislations. Diversity in boardrooms is measured by tenure, age, race, experience and ethnicity, however, gender is the most relevant and discussed factor (Harvard Law, 2017). In Europe 22.6 % of board seats and 4.4 % of the positions as chairman of the board in public companies were held by women as of 2017 (Mikkelsen, 2017). The European Union has proposed that at least 40 % of the board seats should be held by women. In Sweden, 31.7 % of board seats are held by women, which is only lower than France 40 % and Norway 42 % (Mikkelsen, 2017). The Swedish Corporate Governance Code (2016) states that listed companies should have at least 40 % women among the board of directors. It states that this goal needs to be met by 2020 annual general meeting and that companies need to report their work with diversity. However, it is important to recognize that the Swedish Corporate Governance Code is a comply or explain soft law and not enforceable law and the effects of this remain to be seen.

We expect board diversity and independence to have a negative relationship with the underpricing of IPOs. This relationship will be investigated among listings between 2015-01-01 - 2018-12-31 on the Nasdaq Stockholm AB's two Swedish stock exchanges, Nasdaq Stockholm and Nasdaq First North. We also split independence into independence from owners and independence from company to see if there is a difference in the amount impact. Lastly, we investigate if diversity's effect on underpricing is impacted by independence through interaction terms.

Adams & Ferreira (2009) explain the additional economic gains that is possible with a gender diverse board, suggesting that it enhances effectiveness and strategic decision making. Therefore, there are both economic and ethical incentives to strive for a gender diverse board. Morrison (1992) argues that being open to having women on the board can lead to competitive advantages by further utilizing diversity within the corporation. The reasons as to why there are fewer women in the board of directors differ. Groysberg et al. (2016) claim that two of the main reasons are that there is a lack of qualified women and that there is a male-nepotism in the nomination process. Kesner (1988) shows that women contribute to the board by having a different background than males. Campbell and Minguez-Vera (2008) further discuss the importance of a diverse board as it sets the entire direction of the company. Adams and Funk (2012) also conclude that diversity is central as a competitive advantage as people with different backgrounds may have different experiences and viewpoints. One of the places that these advantages might present themselves is when a firm goes public. When going public, a percentage of the shares are sold to the public. It is common that the initial price of these shares do not match their true value. Underpricing is that new listings and issues are often priced lower than their actual value, which makes for a positive first day return. This is mainly due to information asymmetry among investors, and therefore under informed investors require a discount to invest (Rock, 1986). As diversity is linked to better performance, it is also linked to the reduction of information asymmetry through signalling. According to Spence (1973), information asymmetry is the main cause of underpricing of IPOs. Thus, firms with more women on the board could send positive signals and should therefore be able to claim a higher price when going public. Investigating the relationship between IPO underpricing and diversity is of high interest in order to determine whether a firm with a more diverse board is underpriced differently. Since more investors strive for board diversity among their investments, it could be reflected in the underpricing phenomenon (Harvard Law, 2017).

The board of directors have the responsibility of making the strategic decisions, affecting the company's success. According to the agency theory, the board of directors is a protective device that has the role to represent all shareholders (Fama & Jensen, 1983). If the board of directors is well composed, the firm could perform better and receive a higher valuation (Hermalin & Weisbach, 2003). This is further supported by the resource dependency theory which suggest that a board with broader background and access to more resources would steer the firm in a better

direction (Pfeffer & Salancik 1978). There are some prior studies on the effect of board independence on underpricing but there are gaps in the research on the Swedish market (Bertoni et al. 2014, Zattoni et al., 2017). In the prospectus before going public on Nasdaq Stockholm and Nasdaq First North in Sweden, companies have to disclose which board members are independent from the company and independent from the owners. This should affect the investors view of the IPO and therefore affect the underpricing.

The research question in this paper was investigated through a quantitative approach. The final sample consisted of 188 listings on Nasdaq Stockholm and Nasdaq First North. These are regressed using OLS. In this study, a positive relationship was found between diversity and IPO underpricing, however with no statistical significance. A weakly statistically significant positive relationship was found between *Independence* and *Underpricing*. No statistically significant relationship was found for independence from company or for independence from owners. Furthermore, firm age showed a significant positive relationship and the gender of the chairman showed a negative relationship to underpricing. Lastly, an interaction effect with weak statistical significance was found between *Independence from owners* and *Diversity*. We hope that this study contributes to the investigation of the area of diversity and board independence in Sweden and motivates further research.

2. Literature review

The following section will present relevant prior research on the areas of underpricing the impact of board diversity and independence

2.1 Underpricing

In 1986, Rock published a paper where he investigated why new issues and listings were underpriced. The main argument is that information asymmetry is present between different investors and under informed investors therefore require a discount to invest in new listings. This paper set the start for a new investigation into the underpricing phenomenon. Loughran and Ritter (2004) showed that the average underpricing during the 1980s were 8 % and 15 % during the 1990s, except for during the internet bubble between 1999-2000 where the average underpricing was 65 %. As shown by Loughran et al. (1994), underpricing differs between different countries. They found that the average underpricing in Sweden had been 25.9 % while Norway and Denmark had underpricing averaging on 7.4 % and 8.1 %.

2.2 Diversity's impact on performance

Adams and Ferreira investigated women in the boardroom and its effect on governance and performance in their paper from 2009. They used a sample of US firms with 4174 observations and found a negative relationship between gender diversity and firm performance. They discuss many theories which are relevant for this research paper and that might help to understand and explain the results. Lückerath-Rover also investigated this in 2010 among 99 Dutch companies to determine if there was a relationship between women on the board and firm performance. They base this paper on both moral arguments, diversity between men and women, as well as economic arguments, that companies with women perform better. The paper shows a positive relationship between women on board and firm performance. In 2012, Adams and Funk took this subject further and investigated the different characteristics among women and male directors. They found many significant differences and the most important one is that female directors in their sample were more risk taking, meaning that boards with women did lead to less risk-averse decision making. The authors discuss the effect of diversity in the board, which is central to our research

subject. Chapple and Humphrey (2013) investigate women in the boards effect on performance in Australia, a jurisdiction where they recommend disclosures on women in the board, rather than quotas, much like the situation in Sweden. However, they could not find a relationship between women on boards and long term firm performance. All of the above papers make it interesting to investigate whether women on boards effect on underpricing or not as it could be affected through signalling.

2.3 Diversity's impact on underpricing

In 2014, Chen investigated the corporate governance impact with IPO underpricing in a cross-national sample using a *multi-level knowledge-based* view. Across 17 countries he found that board director knowledge limits underpricing. Subsequently, since the knowledge increases with diversity, the underpricing of IPOs should decrease with the diversity of the board. Handa and Sigh (2015) looked at underpricing and its relationship with women on the board in developing countries and India. Their research showed a negative non-significant effect. This paper suggests further research when there are more boards with women, which is a gap this paper could fill. The negative effect from board diversity on underpricing is something that might be present in Sweden due to the social environment. Also, in 2015 Reutzel and Belsito investigated the relationship between female directors and underpricing among US firms that went public between 1997 and 2007. They found a negative bias towards women, however, it seems to weaken after the Sarbanes-Oxley act. Ales et al. (2016) looked at 75 IPOs in Central Europe to investigate different board structures and if diversity influenced underpricing. In accordance with signalling theory, their working hypothesis was that diversity is negatively associated with underpricing but ultimately, they found a significant positive relation between gender diversity and underpricing. The more diverse a company is, the higher the closing price is compared to offer price. This is not in line with what we expect to find on the Swedish market. McGuinness (2018) investigated the Hong Kong market for a relationship between women on the board and long- and short-term performance. He finds a correlation between women on the board and long term performance, however only little evidence of a link with IPO underpricing. The paper presents relevant theories regarding underpricing and diversity in the board.

2.4 Board Independence impact on underpricing

Bertoni et al. (2014) studied if board independence had an effect on IPOs. They investigated a sample of 969 firms in central Europe between 1995 - 2011. They found that board independence is a critical factor when valuing IPOs and argue that corporate governance needs to be studied surrounding IPOs. They showed that, through signalling, firms in UK could go public with less underpricing due to board independence. Zattoni et al. (2017) investigated if board independence affected long term performance as well. They found a positive effect, however it was weak. Their main finding though, was that the effect differs across different nationalities. This paper connects board independence with IPO and underpricing.

2.5 Summary

The papers above provide a sound starting point for our paper. The studies show different results concerning the impact that board diversity and independence have on underpricing. An apparent development is that the number of women on boards and independent directors is increasing which makes this area relevant to investigate. The provided papers use different data where their samples vary in size, region and time. It is important to understand that this is a fast moving subject and the results therefore vary depending on the year of the research and that it also differs between jurisdictions and societies. However, most papers are agreeing on theory where they see board diversity and independence as something positive and draw the conclusion that it could have a negative relationship with underpricing. Furthermore, the papers provide insightful theories and relevant control variables that could be included in the regressions to enhance the value of the model.

3. Theoretical background and hypothesis development

The following chapter will first present the IPO process and the underpricing phenomenon. This is followed by relevant theories concerning IPO underpricing, where agency theory is seen as central. Later, theories regarding the effect that independence and diversity might have on underpricing is presented. Furthermore, the hypotheses are formulated.

3.1 The IPO process

Performing an initial public offering implies that a company, also called the issuer, is listing their shares on a public stock exchange. A certain amount of the shares, which is called the free float, is then accessible to both institutional and retail investors. This process makes a private company become *public*. Going public is not cheap and the process requires an *underwriter* that is willing to act as a meddler between the firm and the market. The underwriters are used as way to overcome information asymmetry between the existing parties. They are often bigger investment banks and in some instances more than one underwriter is used. The underwriters perform due diligence and act as advisors throughout the process. They can advise the issuer on the optimal security to offer, the price and the timing of the IPO. The IPO process can often be long, taking over a year, and can become expensive. Firms pay an average of 7 % of gross proceeds in underwriter fees for their IPOs (Dalton, 2005). Despite it being a substantial fee, many firms are willing to pay this to become public. The underwriter and issuer often agree on a firm commitment, meaning that the underwriter buys all shares and resells them to the market, guaranteeing a minimal sum of raised capital to the issuer. The whole process starts with the firm deciding whether or not to go public. If the decision leads to going public, an underwriter is contacted and the initial process begins. The underwriter will perform due diligence, legitimises the firm's status and puts all relevant information regarding the upcoming IPO in a prospectus. When putting together the prospectus it is common to have an IPO team consisting of at least the underwriter, legal advisors and certified independent accountants. The IPO and prospectus are then promoted to investors through a so called *road show*. The number of shares that will be sold, the free float, and the price is then set by the management together with the underwriter. When the listing day comes, all shares are listed on the stock exchange and available to all investors. When the first trading day comes to an end, the offer price can be compared from the closing price to determine the success of the IPO. As

IPOs are underpriced to make sure the issue is fully subscribed, the price is expected to increase about 10 % the first trading day. (Dalton et al., 2003)

3.1.1 Why firms go public

Several reasons exist as to why firms go public and these can range from a desired equity injection to a change in capital structure. Listing a firm enable public investors to purchase and sell the shares, connecting the firm even closer with its surroundings. This can act as a way for the firm to further demonstrate its mission to a greater public (Bodnaruk, 2008). Another common reason demonstrating the importance of staying connected to the market, is the possibility to raise additional capital which is a mean to avoid illiquidity should the firm face a dire situation. Larger firms often use IPO as a way for big owners to make an exit while smaller growing firms use it for access to capital (Berk & DeMarzo, 2016).

The pecking order theory, as described by Myers and Majluf (1984), implies that the reason as to why firms go public and try to raise external funding is due to the lack of internal funding and accessibility of raising debt. Why this is costly is due to information asymmetry and additional costs from monitoring. While debt is often cheaper, certain constraints regarding covenants and capital structure policies could make debt financing unobtainable. In regard to information asymmetry debt is however in many cases superior (Bodnaruk, 2008). From this view, should the firm run out of internal funds and lack the ability of debt financing, external equity injection through an IPO is their only way of financing. This kind of financing is by the means of information asymmetry one of the riskiest due to hardships in knowing what management and executives are doing. This is one of the reasons why underpricing exists and reinforces the role of the underwriter as a way to create legitimacy and trust for investors.

Market timing theory in corporate finance, presented by Baker and Wurgler (2003), dictates that some firms utilize going market rates and optimism to structure their IPOs as a mean to raise as much capital as possible when the time is right. This could have implications for how the capital structure is formed. This could also cause potential biases for this paper due to possible market optimism where essential board of director attributes are neglected. Some IPOs are however

undertaken without any obvious reason. These could instead be driven by the management's feeling of accomplishment for becoming a publicly traded company. Smaller firms with entrepreneurs often suffer this problem. IPOs can also facilitate transaction issues. Performing an IPO creates, as previously mentioned, possibilities for selling and trading current shares and thus makes a good platform for divesting (Bodnaruk, 2008). This proves useful dealing with Venture Capital or Private Equity backed firms as the entrepreneur has an opportunity to divest. Furthermore, while current research is indecisive, Bodnaruk (2008) concludes that ownership concentration to a higher degree leads to firms going public. This would be particularly interesting in Sweden, since it has a highly concentrated ownership through, for example the Wallenberg sphere. Sweden has had a high number of IPOs over the recent years Bodnaruk (2008).

3.2 IPO underpricing

IPO underpricing has for a long time been a well-established phenomenon (Rock, 1986), and it is as a general puzzle thoroughly investigated yet unsolved (Berk & DeMarzo, 2016). Underpricing means that the price of the issue is set lower than the market price, which in turn results in positive returns the first trading day. The puzzle of IPO underpricing is clouded behind theories of signalling and information asymmetry. The underwriter may have incentives to sell shares below the market price as a way to ensure that all shares are being sold. Ritter and Welch (2002) suggest that this is true for every market. While many things can be learnt from prior research, investigating the diversity and independence aspects can shed further light on this delicate phenomenon, especially on Nasdaq Stockholm and Nasdaq First North.

3.2.1 Information asymmetry

The winner's curse theory concerns the fact that a winner of an auction often pays a higher price than the intrinsic value of the item. This phenomenon has been widely discussed and was described as early as in 1986 by Rock. The theory suggests that under informed investors obtains lower allocation of stocks in underpriced IPOs. This is an effect of the fact that they invest in every IPO while informed investors only invest in the ones they expect to be underpriced. This causes under informed investors to obtain lower returns and make them averse from investing in IPOs. Two

years after Rock's paper, Richard Thaler (1988) continued this investigation. He claims that winners of the "auctions" are cursed since the only reason that they win is because they overvalue the asset. Subsequently, this makes the seller of the shares in an IPO rationally and consciously underprice them to attract investors. This theory ties together with, and is partially based on Akerlof's (1970) paper on information asymmetry. In 1970 Akerlof presented his theory *Market for lemons* which is based on the knowledge that the seller knows more about the product than the buyer. This means that the buyer does not know if the product is a lemon or a cherry, and the seller will always try to make the product mimic a cherry. This results in that IPOs in general are underpriced to satisfy the demand of the buyer. According to Draho (2004), this is the main reason for the underpricing of IPOs and one of the main reasons for information asymmetry is the separation of ownership which will be discussed further in the following sections.

3.2.2 Signalling theory

As explained above, information asymmetry plays a large role during IPOs and is one of the biggest determining factors for underpricing (Spence, 1973). One way to affect and mitigate information asymmetry is through the use signalling. Signals are of high importance to communicate credibility for potential investors. By using signals, the company will try to communicate their true value to outsiders (Daily et al., 2008). Since the signals need to reach investors prior to the company going public to have an effect on the underpricing, the prospectus is seen as one of the main signalling tools (Daily et al., 2008). Corporate governance, including board diversity and independence, is a central part of the prospectus before going public on Nasdaq Stockholm and Nasdaq First North. By using the prospectus for signalling, for example to show a sound board structure, higher quality firms can prove themselves over lower quality firms. Leland and Pyle (1977) suggest that female directors are a good tool to transmit the potential of the corporation to the investors. Bilimoria (2002) suggests that by promoting women within the board, a corporation can elevate their legitimacy in accordance with the institutional theory. This is linked with the signalling theory and Bilimoria suggests that by empowering women on the board, the corporation can signal a sound governance. It is of interest to investigate this on the Swedish market where investors might see it as a positive signal. As discussed above, to lower the

information asymmetry means maximising the price the owners get, and thus lowering the IPO underpricing. This means that women on the board could lower the underpricing of the IPO.

3.2.3 Window of opportunity

This theory is based on the fact that the IPO market is highly cyclical, with some periods where investors see positively on the growth potential of companies (Jarrow et al., 1995). Subsequently, this increases the underpricing of the IPOs during these specific periods as the interest is higher from investors (Ritter, 1991). The author suggests that if one can determine the periods when investors have a positive view of the market, they can time their investments in IPOs, to potentially obtain higher returns. The theory can further help to explain the underpricing phenomenon and it can affect studies where the time period is long which might skew the results. This theory is closely related to the hot issue market theory, presented by Ibbotson (1975). He showed how the IPO market is cyclical and that different years yield different results in underpricing. This was further investigated by Welch (2002) who concluded that the market can be hot or cold and that this is one of the most determinant factors behind IPO underpricing.

3.3 Board Diversity

3.3.1 Agency Theory

In 1983, Fama and Jensen discussed the survival of organizations where "important decision agents do not bear a substantial share of the wealth effects of their decisions". As they explain, this is a problem which have troubled many economists for a long time. The separation of ownership and control allows for the owners to be passive principals, letting the management act as agents. This is crucial as it allows owners to diversify their portfolios which increases the liquidity and available funding for companies (Ogden et al., 2003). The separation of ownership and control means that the owner carries part of the risk which the management is responsible for. In agency theory it is assumed that every actor is acting in their own favour. This results in agency costs stemming from the actions the owners take to ensure that the management is acting in their favour. This is where the board comes in to monitor the management and delegate responsibilities to ensure that the management acts in the favour of all owners (Carter et al., 2003). The theory is central in prior research and combined with further theories it can facilitate the understanding of

how the board composition affects the strategic decision making of the company (Hermalin & Weisbach, 2003). Therefore, this theory is essential in the matter of board independence and diversity and their effect on IPO underpricing. Both board diversity and independence could lower information asymmetry as well as agency costs and should thus lower the underpricing of the IPO.

3.3.2 Upper Echelon Theory

The upper echelon theory was first presented in 1984 by Hambrick and Mason and their paper has been cited over 10.000 times and is widely discussed. The theory aims to predict organizational outcomes by studying the characteristics and background of the management in the company. They argue that decisions are connected to the individual's values and cognitive base and that they reflect their idiosyncrasies. To the decision making process, each individual will bring knowledge about future events, knowledge of alternatives and knowledge of consequences attached to each alternative (Hambrick & Mason, 1984). Different backgrounds and characteristics affect these values and cognitive biases, and thus, the gender diversity of the board and gender of the CEO is important to investigate. Hambrick and Mason present how different combinations of managers handles different problems. For example, if the problem is simple and routine, a homogenous management team handles it more effectively. However, if the problem or decision is complex and in a fast paced environment, a heterogenous management solved it more effectively which results in a more profitable organization in the end. This theory can be used to predict the company's decision and can therefore be connected to the underpricing phenomenon.

3.3.3 Resource Dependency theory

The resource dependency theory was first formalized in 1978 by Pfeffer and Salancik. The theory surrounds how strategic decisions are affected by the available external resources from the company. Pfeffer and Salancik argue that the board is responsible for handling the external environment, capturing the opportunities and avoiding the risks the company is exposed to. Therefore, the board's composition and experience are crucial for the competitiveness and survival of the company. This is where Adams and Ferreira's (2009) argument becomes relevant, that higher economic gains can be possible with a gender diverse board, as it increases effectiveness

and strategic decision making. As further presented by Morrison (1992), a gender diverse board enhances the competitiveness of the company by utilizing diverse contacts and experience of the members of the board. These statements are further confirmed by many papers, such as Kesner (1988), Campbell and Minguez-Vera (2008) and Adams and Funk (2012). A diverse board can generate profits, for example by lowering transaction costs by using their broad network and will thus provide competitive advantages (Hillman et al., 2000). That a diverse board with a broader experience and background brings profitability has further been shown by Carter et. al (2003).

3.3.4 Groupthink

Groupthink was originally discussed and explained by Janis (1972) and has had a large impact on the social sciences. This is due to its revolutionary stance on intra-group social powers that conform the individual to perform and behave in a certain way. This type of groupthink is especially prevalent in positions of power and where members are in high prestige (Janis, 1972). Groupthink creates a distorted view of the surroundings while creating homogenic decision making process. The effects of groupthink are a reduced sense of moral and can decrease problem solving capabilities on a group level. (Hart, 1991) It also reduces the sense of change and conforms the group to their current situation, which effectively inhibits change (Janis, 1982) Having a certain type of characteristics in the board of directors could lead to issues with groupthink. This is also discussed by Janis (1972) as similar previous experience and socio economic background was one of the causes for groupthink. Having a higher amount of diversity as well as different background and education could reduce the risk of groupthink in the board of directors, and this is expected to decrease underpricing through signalling (Kamalnath, 2017).

3.3.5 Women on Boards Theory

Women on Boards theory (WOB) mainly focus on two directions; the resource dependency and agency theory. As presented above, the resource dependency theory stresses the fact that diverse resources are crucial and linked to the performance of the firm (Johnson et al., 1996). This pinpoints that women's contribution through the board will further maximise corporate performance. The agency theory suggest that a diverse board will minimise the costs of mitigating

agency problems which arise from separation of ownership (Watson et al., 1993). The theory of WOB have been widely discussed and is of academic interest, especially in the Western countries (1988; Bilimoria and Piderit, 1994; Daily et al., 1999; Carter et al., 2003). This theory further shows how the presented theories connect to the effect of women on boards. Subsequently, this theory further implicates that there should be a relationship between women on the board and underpricing.

Since firms are eager to lower underpricing as mean to maximise capital gains they are actively trying to bridge the information gap between investors and themselves. This is done through signalling and one way of signalling is through the board composition. Having diversity in the board of directors would imply that the firm is less susceptible to groupthink according to Hambrick and Mason (1984). Effectively having women on the board firms would be able to increase operational performance (Johnson et. al, 1996) as well as increased economic gains due to enhanced strategic capabilities (Adams and Ferreira, 2009). It is thus in the interest of the firm to present themselves in the best way possible. Besides the positive outcomes of diversity such as avoiding groupthink, it is also an effective way of signalling.

H1: Increased Board diversity will lead to a decrease in underpricing

3.3.6 Board independence

Also connected to agency costs and signalling theory is the theorem of board independence. Board independence has different definitions across different countries but is in Sweden defined by the Swedish Corporate Governance Board. The theory surrounding board independence is focused around reducing agency cost. One of the issues with the lack of ownership incentives on a managerial level is that it can create agency costs due to the agent taking actions in own self-interests (Godfrey et al., 2006). This requires internal monitoring and board supervision is one of the more commonly used (Zahra & Pearce, 1989). Dalton and Dalton (2011) argue that the monitoring aspect of the board can be enhanced by having the board members being independent from the company in order to eliminate biases. This is also supported by Rashid (2014) who concludes that board independence can reduce agency costs. The additional level of control and

monitoring provided by the independent board members would ultimately result in better performance and a higher degree of wealth being created for the shareholders (Dalton & Daily, 1999).

While different definitions exist for independence, the Swedish Corporate Governance Board, which the majority of companies follow, sets the definition for Swedish firms. It puts emphasis on two different types of independence; independence from the company and independence from major owners. The majority of board members should be independent from the company. This independency is determined by checking if the directors have been CEO or had any other important roles at the company or its affiliates earlier. This involvement also includes taking part in the firms auditing process or even being part of another firm that another board member is involved in. This also concerns close family members having large stakes in said firm. There could also be a level of board independence from large owners. This assessment is carried out through investigating the members' previous relations from owners, and any existing employment is treated as a dependency. The requirement for the Swedish Corporate Governance Board is that at least two out of the board members that are independent from the company also could be independent from the owners. Board independence from owners is seen as positive because the board member will act without any biases from large owners. Board independence from company is seen as positive as the board member will act in the interest of the shareholders. Board independence seem to have the same signalling value as board diversity. Board independence has been connected to abnormal returns as seen by (Dalton & Daily, 1999). Having independent board members would subsequently act as a signal in order to create trust between the firm and the market. This should, through signalling effects, affect the underpricing of new listings and issues.

H2.1: Board independence will lead to a decrease in underpricing

The variable for independence is further split into independence from company and independence from owners, as they are presented in the prospectus. This is done to investigate if there is a difference in the impact of the two.

H2.2: There will be a difference in the impact on underpricing from independence from owners and independence from company

Lastly, interaction variables between diversity and independence are created to see if they have an interaction effect on underpricing.

H3: The relationship of underpricing and diversity is impacted by independence

4. Methodology

This section will describe the methodology used in this paper. The approach will be presented, followed by the model development.

4.1 Scientific approach

This paper is based on the deductive quantitative approach using data analysis described by Lundahl and Skärvard (1999). Hypotheses were formulated through analysis of prior research and a descriptive and explanatory analysis were made to understand the variables impact. This is the most common method when approaching financial matters (Gippel, 2013), however it could come with downsides. A common downside, according to Bryman and Bell (2011), is that it can be difficult to economically explain the relationships that the regression finds. Through the theoretical framework, the economic reasoning behind the results are further explained. The approach could have been combined with a qualitative method to further explain the results. A qualitative method can sometimes explain relations found in quantitative methods by providing further information that would not be present in the quantitative method.

4.2 OLS assumptions

The quantitative method behind this paper is carried out through the use of ordinary least squares (OLS), which is often used for econometrics and empirical research in order to derive relationships between different variables. This method is commonly used when dealing with cross-sectional data, which is used in this paper. The use of OLS will enable interpretations of the coefficients of the variables to draw conclusions regarding their relationship to underpricing. The OLS regression relies on five assumptions:

1. Linearity in parameters
2. Random sampling
3. Sample variation in explanatory variable
4. Zero conditional mean for error term
5. Homoscedasticity

The first assumption of linearity is in the parameters being used to explain the dependent variable. The second assumption is based on the sampling method and that the collected sample is representative of the whole population and is random. The third assumption is that of sample variation would result in changes in the explanatory variable. No perfect collinearity in the sample can be present. The fourth assumption concerns the expected value of the error terms and that they in the population are assumed to be zero, given the different value of the explanatory variables. The explanatory variables have to be exogenous. The fifth assumption concerns homoscedasticity in the error terms and that they are normally distributed. If these assumptions are fulfilled, OLS is the best linear unbiased estimator.

4.3 Model development

In order to answer the three formulated hypotheses, three different models are developed. Initial investigation of the possible relationship between diversity and underpricing is carried out through a series of regressions seen in *Table 6*. The regressions show no statistically significant relationship between the variable *Diversity* and *Underpricing*. The regression has been done on standard error terms. Several tests are done for heteroskedasticity, which is prevalent in this preliminary regression. Robust standard errors are therefore used when investigating this relationship further. Yearly dummy variables are also added to illustrate yearly effects that might have an impact on underpricing. The variables included show consistent signs and coefficients, indicating robustness. What can be concluded is that the variable *Diversity* show similar signs and lack any strong coefficients. While no statistical significance could be seen for *Diversity*, there is still reason to investigate this relationship further and examine how it interacts with other explanatory variables.

Model 1

$$Underpricing_i = \beta_0 + \beta_1 \times Diversity_i + \delta \times \sum Controls_i + \varepsilon_i$$

The second model concerns independence and is developed in order to answer the second hypothesis about the effects of board independence on IPO underpricing. This is done through *Table 7* where Independence is initially regressed against underpricing. There is no initial statistical significant result and error terms show heteroscedastic tendencies. As a result of this,

robust standard errors are used and lastly, yearly dummies are added. The variables show consistent signs across the regression table, indicating robustness. Independence has until now been treated as a combination of independence from owners and independence from company. In order to investigate Hypothesis 2.2, whether there is a difference in the impact on underpricing between independence from company and independence from owners, independence is replaced by two variables, Independence from owners and Independence from company. These two variables are regressed against underpricing in order to determine type-specific characteristics.

Model 2

$$Underpricing_i = \beta_0 + \beta_1 \times Independence_i + \delta \times \textstyle\sum Controls_i + \varepsilon_i$$

These initial regressions pave way for how the third model will be developed and provide a sense of robustness in the explanatory variables. Since *Diversity* and *Independence* have explanatory power, they are merged into one regression. An interaction term is then created between them in order to answer the third hypothesis. Yearly effects are also added.

Model 3.1

$$Underpricing_i$$
$$= \beta_0 + \beta_1 \times Diversity_i + \beta_2 \times Independence_i$$
$$+ \beta_3 \times Independence_i \cdot Diversity_i + \delta \times \textstyle\sum Controls_i + \varepsilon_i$$

In order to answer the third hypothesis, the two forms of independence are also interacted with diversity to answer whether they have an impact on the relationship between diversity and underpricing, based on the specific type of independence, seen in *Table 8*.

Model 3.2

$$Underpricing_i$$
$$= \beta_0 + \beta_1 \times Diversity_i + \beta_2 \times Independence\ from\ Company_i$$
$$+ \beta_3 \times Independence\ from\ Owner_i + \beta_4 \times Independence\ from\ Company_i$$
$$\cdot Diversity_i + \beta_5 \times Independence\ from\ Owner_i \cdot Diversity_i$$
$$+ \delta \times \textstyle\sum Controls_i + \varepsilon_i$$

Some of the variables are in natural logarithm, such as *Pre-money valuation* and *Board size*. The variables for diversity, stock exchange, years and industries are constructed as dummies. Board

independence has been connected to effective governance control and diversity has been linked to better performance. However, independence might be treated differently depending on whether or not the board of directors are gender diverse. Independent diverse boards could perhaps reinforce the signal of staying involved, effectively enhancing its credibility. This would further suggest a board with a higher sense of control, which will reduce agency costs due to monitoring and stockholder focus. We therefore expect that it is perceived as positive if a company is both diverse and independent in the board prior to the IPO. Therefore, an interaction term was created from *Diversity* and *Independence* and two from *Diversity* and *Independence from owners* as well as from *Diversity* and *Independence from company*. The type of format of the variables has implications for how the regression coefficients are interpreted. Due to *Board size* and *Pre-money valuation* being in natural logarithm, the interpretations would imply an increase of one percent in either would result in an increase in *Underpricing* of the coefficient divided by 100 of *Underpricing*.

$$\Delta Underpricing_i = \frac{\beta_1}{100} \times \Delta x$$

For level-level models as the main explanatory variables are, a one unit increase in board diversity would result in *Underpricing* changing by the coefficient.

$$\Delta Underpricing_i = \beta_1 \times \Delta x$$

5. Data and descriptive statistics

This section presents the data gathering process and the institutional background in the data. It will also discuss the statistics of the different variables.

5.1 Sample Construction

The final sample consisted of 188 listings, 57 from Nasdaq Stockholm and 131 from Nasdaq First North. The time period of 2015-01-01 - 2018-12-31 was chosen to keep the sample as relevant as possible. The time frame was also chosen due to the Swedish Corporate Governance Code being revised in 2015 to include how companies work with gender equality in the board. A longer period could have been chosen to increase the sample size, however the relevance was prioritized mainly due to the increase in diversity in recent years, which should provide listings with higher board diversity. Furthermore, the time frame avoids unusual happenings such as the financial crisis in 2008 and should thus give a less biased result. The two marketplaces, Nasdaq Stockholm and Nasdaq First North were chosen as they are two of the main marketplaces in Sweden and are operated by the same company. Since they have different regulations it could also be of interest to see whether there are any differences in the underpricing. In accordance with prior literature, only common shares were investigated, and preferred stock were therefore excluded (Ritter, 1999). Moreover, only primary listings were included. Spin-offs and list changes were excluded from the sample. Lastly, listings of real estate were excluded since they are not seen as regular company listings.

5.2 The Swedish Context

5.2.1 Nasdaq Stockholm AB

Nasdaq Stockholm and Nasdaq First North are two marketplaces in Sweden, both operated by Nasdaq Stockholm AB. The main difference is that Nasdaq Stockholm is a regulated stock exchange while Nasdaq First North is an unregulated market, also called a Multilateral Trading Facility. Nasdaq Stockholm AB has a license from the Swedish Finance Inspection to operate the regulated market Nasdaq Stockholm (Nasdaq Stockholm AB, 2017). The listings on Nasdaq

Stockholm are characterised by more mature and screened companies while Nasdaq First North is more fitted for smaller growth companies characterised by higher risk. This is to allow smaller and less profitable firms, that do not have the possibility to adapt to the regulations, to go public. Those listings that are successful often change stock exchange to Nasdaq Stockholm later on. Moreover, companies listed on Nasdaq Stockholm have to ensure that the boards are diverse and independent to a certain degree. These differences are something we can expect to affect the underpricing on the two marketplaces.

5.2.2 Diversity and Independence in Sweden

The effect of board diversity is a widely discussed subject and there are several theories which suggest how and why women in the board could affect the underpricing and performance of firms. Diversity is expected to be present among listed Swedish companies due to the pressure from the Swedish Corporate Governance Code. However, as mentioned before, unlike in countries such as Norway, the code is not a law in Sweden but rather a comply or explain soft law and a complement to the regulatory act of Aktiebolagslagen (SFS 2005:551). This makes the diversity matter interesting, as companies will follow the code to different extents. If it was a law, every company would be forced to follow it, and for example have at least 40 % women among their directors. As it is not a law, the signalling value of having gender diversity could become stronger. Therefore, the pre-IPO signalling could affect the underpricing. The Swedish Corporate Governance Code was first introduced in 2004 and after some revision in 2005 it became a requirement for large cap listings in Sweden to abide by it. Since 2008 it has been a requirement for all listings on Nasdaq Stockholm, however, listings on Nasdaq First North are still unrestricted by the code. Today, companies are suggested to follow it, and should make comments on when and why they do not follow it. The code has been under constant revision and the latest started in 2015, which aimed to include how companies work with gender equality in the board. The code aims to increase trust in Swedish listed companies by promoting a sound governance. (The Swedish Corporate Governance Code, 2016)

5.3 Dependent variable

5.3.1 Underpricing

In our paper, the dependent variable, *Underpricing,* is the difference between the offer price and the close price the first trading day. This is in line with prior research of IPO underpricing and short term returns (Ritter, 1999). A positive underpricing is when the closing price the first day exceeds the offer price of the issue. When the offer price exceeds the first day closing price, overpricing occurs, which is expressed in negative percentages. However, this is not as common as underpricing is among new listings. The dispersion of *Underpricing* over the firms are shown in *Figure 1*. The observations show similarities to being normally distributed even though outliers are present. The definition and sources for all variables can be seen in *Table 1*.

5.4 Independent variables

5.4.1 Board Diversity

When it comes to underpricing and the signalling that affects it, it is of interest to investigate board diversity. Many earlier papers, such as Adams and Ferreira (2009) and Campbell and Minguez-Vera (2008), conclude that women in the board have a positive impact on profitability and firm performance. There are studies which show that women in the board can have a negative impact on the IPO underpricing (Reutzel & Belsito, 2015). Nonetheless, this was in the U.S and it is expected that women in the board will be perceived more positively in Sweden as it has progressed further in the gender diversity discussion (Edström & Brunila, 2016). As women on boards often show a positive impact on firm performance, it is expected to impact underpricing as well through signalling. In this paper, board diversity is measured as a dummy variable if the board has a gender diversity consisting of 30 – 70 % females, which is in line with the Swedish Corporate Governance Code (2016). The gender diversity dispersion is illustrated in *Figure 2* and that some boards completely lack gender diversity is shown. More than 35 % of the boards investigated had zero gender diversity. Only a handful of the firms had more than 50 % gender diversity. The variable is labelled as *Diversity* in the regressions.

5.4.2 Board Independence

The independence of board members became a central topic after Cadbury's publication in 1992. Since then, the definition of what an independent board member actually is has been discussed. As our study is based on Swedish listings, two different variations of independence were investigated, since companies have to present this in the prospectus before being listed on Nasdaq Stockholm and Nasdaq First North. The first one being independence from the company and the second one being independence from the owners. A collective measure of the two were also used initially. Having independent board members could signal a broader network of experience and less biasness and thus the effect on underpricing is expected to be negative. As board independence is a measurement for monitoring and control, having an independent board should be followed by reduced agency costs. This combined with the signalling effects should decrease the underpricing. In this study we classify board independence according to The Swedish Corporate Governance Code (2016). *Independence from company* is illustrated in *Figure 3*. The histogram shows a negative skewness which is expected due to the regulations by the Swedish Corporate Governance Code. Independence from owners is illustrated in *Figure 4*. The variables are labelled as *Independence, Independence from owners* and *Independence from company.*

5.5 Control variables

Table 2 contains the general descriptive statistics for the variables. The categories for the industries were retrieved from Capital IQ database. *Underpricing*, calculated from offer price and first day closing price, *Stock exchange* and *Pre-money valuation* were retrieved from Bloomberg. Supporting data on closing price was retrieved from Borsdata.se, which provide data for the Swedish market. Lastly, *Gender of chairman, Gender of CEO, Board size, Board diversity, Firm age* and *Board independence* were derived from the prospectus of the IPOs. All data is from the listing date on Nasdaq Stockholm and Nasdaq First North for each individual IPO. *Underpricing* and *Board independence* is measured in percentage, pre-money valuation is in MSEK, firm age is measured in years, board size is in individuals. industries are dummies (1 if the actual industry). Gender of the CEO and chairman of the board is 1 if female.

As risk plays a central role in determining underpricing, the pre-money valuation becomes important as it is a measure for the size of the company. This is because bigger companies are regarded as more stable and diversified than smaller firms (Finkle, 1998). Furthermore, larger companies, for example those listed on Nasdaq Stockholm, will be more screened, monitored and regulated and therefore the risk will be lower (Kiymaz, 2000; Bhabra & Pettway, 2003). The usage of pre-money valuation as a proxy for firm size is also in line with Abrahamsson et al. (2011). Many studies show that increased firm size lowers the risk and subsequently the underpricing (Titman & Wessels, 1988; Schultz, 1993). However, some studies have shown a positive relationship between pre-money valuation and underpricing (Ibbotson et al., 1994; Carter et al., 1998). *Table 4* illustrates the difference in *Pre-money valuation* for the firms on the two different stock exchanges, Nasdaq Stockholm and Nasdaq First North. There is a difference in the mean, implying that firms on Nasdaq Stockholm have a larger pre-money valuation than firms on Nasdaq First North.

The optimal board size has been widely discussed in prior papers and the different arguments are discussed below. As presented in the upper echelon theory, smaller boards are more effective at handling routine decisions, while bigger and more diverse boards are better at handling more complex decisions. Lipton and Lorsch (1992) suggest that having eight or seven members is optimal and Jensen (1993) argues that having more than that impacts the financial results negatively. On the other hand, Yermack (1996) and Conyon and Peck (1998) find that smaller boards are more effective. It is shown that companies with bigger boards often have more women included (Chapple & Humphrey, 2013). In their study this topic is discussed, and they conclude that as bigger companies often have bigger boards, they often have the possibility to tackle governance factors. Furthermore, bigger firms are often more pressured by social norms and more regulated, for example companies listed on Nasdaq Stockholm instead of Nasdaq First North, which further puts pressure on them to include women in the board (Nasdaq Stockholm AB, 2017). In this paper, the board size is defined as the number of board members, excluding employee representatives which is in line with Bolagsverket's (2012) classification. The variable is in natural logarithm to see the effect of a percentage increase in board size, meaning that the effect of going from 1 to 2 members is bigger than from 7 to 8. This is further in accordance with Carter, Simkins and Simpsons' study from 2003. As prior research shows both positive and negative relationships

between board size and IPO underpricing, the results cannot be predicted. The board size on the different stock exchanges are similar, as depicted in the *Table 5*. As expected, the average board size is higher on Nasdaq Stockholm than on Nasdaq First North.

In this paper, the variable *Firm age* represents the age of the firm before going public and acts as a proxy for maturity. Firm age is related to the size of the company and older, more established companies are expected to have bigger boards and therefore be more diverse according to Chapple and Humphrey (2013). Younger companies are also expected to be riskier and thus have higher underpricing when listed (Berk and DeMarzo, 2016). *Firm age* is consequently expected to be negatively related with *Underpricing*. *Table 6* shows descriptive statistics for *Firm age* between firms who are listed on the Nasdaq First North stock exchange and the Nasdaq Stockholm stock exchange. There is a difference between the two stock exchanges, firms are on average more than twice as old on the Nasdaq Stockholm stock exchange than on Nasdaq First North.

The gender of the chairman and the CEO, labelled *CEO Gender and Chair Gender,* are also investigated. The same reasoning holds for these two variables as for gender diversity in the board as these are positions with bigger influence than a regular board member. We therefore expect the relationship to be negative. The variables are constructed as dummies where 1 means that the position is held by a woman and 0 if not. *Table 7* shows that there is a larger amount of females as chairmen on the board on the larger Nasdaq Stockholm stock exchange than on First North. However, there are more females as CEO on First North than on Nasdaq Stockholm.

Regarding on where the firm is listed, as underpricing is a consequence of signalling and information asymmetry, it is expected to decrease when the uncertainty is lower. Therefore, it is expected that listings on Nasdaq Stockholm, which is more regulated and screened, could have lower underpricing. The variable is constructed as a dummy, labelled *Stock Exchange*, where 1 means that the company is listed on Nasdaq Stockholm and 0 if it is listed on Nasdaq First North.

In prior research it is common to have variables to check for different industries and it is therefore included in this paper (Bhojraj et al., 2003). Each company in the sample is given a dummy for the industry it belongs to according to the Global Industry Classification Standard, GICS. It is also

relevant to check for different industries as the percentage of women on boards differs according to "*Andra AP Fondens Kvinnoindex 2018*". In the report it is presented that industries such as finance and consumer discretionary is represented by higher numbers of women than for example healthcare. Furthermore, the underpricing seems to be different for different industries as some inhibit more risk (Beatty & Ritter, 1986). Loughran and Ritter (2004) could for example find that for listings in the U.S between 1990 - 2003, tech companies were more underpriced than others. This was also found by both Arosio et al. (2000) and Daily et al. (2005).

When researching IPOs it is common to include control variables for the year of the listings. Therefore, in this study, dummies were constructed for the listing year of the issues. This is because the underpricing can differ from year to year, depending on the market conditions at the time of the listing. This relates to the window of opportunity theory and hot market theory. For example, if a company IPOs during a hot pocket, the listing will be more underpriced due to the positivity of investors.

Figure 6 shows the average of diverse boards on Nasdaq Stockholm and Nasdaq First North. Furthermore, it shows the percentage of female chairmen of the board as well as the percentage of female CEOs on the two investigated stock exchanges. We can see that, as expected, Nasdaq Stockholm had more diverse boards and a higher percentage of female chairmen. This was expected as bigger boards have a positive relationship with the percentage of female directors. Nasdaq Stockholm showed an average board size of 5.8 while Nasdaq First North showed an average of 5.1. However, Nasdaq First North showed a higher percentage of female CEOs. This might just be a coincidence due to small sample size. *Figure 7* presents the average independence from company and average independence from owners on the two stock exchanges. Nasdaq Stockholm shows higher degree of independence among directors. This was expected as regulations are stricter on this exchange.

6. Empirical Analysis

This section will present an analysis of the results. Each variable will be analysed both numerically and economically.

6.1 Diagnostics tests pre-estimation

As the underpricing can differ between listings, winsorizing was considered to adjust outliers in order to obtain a more robust distribution of *Underpricing*. While this could have been beneficial, the validity of the data was deemed more important. Following the integrity of the data, the decision was made to not winsorize underpricing.

Correlation tables will be used in order to check variables for correlations that could breach OLS assumptions of perfect multicollinearity. As *first day turnover* and *offer size* had high correlation with *Pre-money valuation* and they were all proxies for size, they were excluded from the final regression. Pre-estimation, a correlation matrix was created showing with the different variables (*Table 3*). The correlation between the variables after excluding the variables for first day turnover and offer size are illustrated here. We can see that *Pre-money valuation* and *Stock exchange* have a correlation of *0.594*, however this is expected since larger companies are listed on Nasdaq Stockholm. Furthermore, there is a high correlation between the interaction terms, which is also expected in the way of their nature. Other than that, there are no major unexpected correlations among the variables that could lead to misspecifications in the model.

One of the more common breaches of OLS assumptions is the error terms not showing homoscedastic tendencies, i.e. not being normally distributed. A Breusch-Pagan and White's test could be run in order to test the error terms for homoscedasticity. Breusch-Pagan test is a common test in OLS based regressions to verify the integrity of the Homoscedasticity assumption. It checks if the error terms created in the regression is correlated with the independent variables. White's test is also used for testing for heteroscedasticity in the error terms but utilizes a different approach than the Breusch-Pagan by checking nonlinear heteroskedasticity. This, alongside with plotting the residuals, provide an extensive evidence whether or not heteroscedasticity is prevalent in the error terms. Should the error terms be of heteroscedastic nature, robust standard errors will be used

for the OLS regression. Some heteroscedasticity was prevalent in the error terms according to the Breusch-Pagan *Test 2* and White's *Test 1* and after plotting the residual variables, as seen in *Figure 5*, we decided to use robust standard errors. The Ramsey RESET test shows that the null hypothesis cannot be rejected. This suggest that there are no considerable non-linear relationships in the regression. Omitted variable bias might be prevalent in this empirical research paper due to unobservable data. Since IPO underpricing is a largely unanswered and complex phenomenon, consisting of many different reasons, our regression could suffer from biases. These include variables that are not directly measurable, such as the level of risk aversion in the underwriter or their previous reputation that could potentially have an impact on underpricing. Information asymmetry in this regard entails hardships in measuring and adds another layer of complexity on this already complicated phenomenon. This could potentially be a source of endogeneity.

6.2 Diversity

The dummy variable for diversity, *Diversity*, shows a positive coefficient of *0.013* with no statistical significance (*Table 6)*. The positive sign of the coefficient is not in line with what was expected from prior research and our main hypothesis. However, the non-significance is in line with some prior research (Marinova et al., 2016, Joecks et al., 2012, Carter et al., 2010). The lack of significance makes any clear conclusions hard to derive. The coefficients are robust and the model is reliable, which can be concluded by looking at *Table 6,* where the coefficients are of similar size and do not change signs. That having board diversity might increase underpricing is against the working hypothesis of this paper. The many benefits of having a gender diverse board such as a reduced risk of groupthink could in theory benefit the board greatly. However, gender diversity is not the deciding factor of how the underwriter and the market prices the firm. Having different people from different backgrounds and education is a more effective way to avoid biases in the boardroom. In terms of resource dependency theory, emphasis is put on different backgrounds and how it improves strategic decision making by providing resources. In the hindsight of this, despite gender equality being the main factor for diversity, it was perhaps not enough for being a proxy for diversity as a whole. This could have led to that the resource dependency theory as well as groupthink might not have had the expected effect in terms of strength. In order for the firm to properly signal strong governance, they might need more than

only gender equality. Trying to instil a message of that one kind of diversity could provide increased performance is perhaps not sufficiently backed and thus casted aside. Instead, individual traits on each of the board members is perhaps taken into greater consideration than only the gender.

6.3 Independence

The original variable *Independence* shows weak statistical significance with a positive coefficient of *0.217*. This is opposite of what was expected as having higher board independence was expected to decrease underpricing. This goes against the formulated hypothesis, implying that independence increases underpricing. This also goes against the literature on the subject that suggest independence should decrease underpricing (Bertoni et al., 2014). This paper is however based on the Central European market instead of Sweden and has a different timespan than our study. Bertoni et al. (2014) also discuss the different effects board independence might have on firms and conclude that younger firms that have less need for separation of ownership and control might not experience the same value increase by having an independent board as older firms would. Since the majority of our observations are from Nasdaq First North where younger and smaller firms reside to a larger extent than on Nasdaq Stockholm, this could explain the positive relationship. Furthermore, the concentrated ownership structure in Sweden could complicate this matter and perhaps emphasise a certain type of board independence.

The variable *Independence from company* shows a positive coefficient of *0.103,* seen in *Table 7,* with no statistical significance. The positive sign was not in line with expectations as the independence was expected to lower the underpricing through signalling. This goes against the formulated hypothesis. This is also not in line with what Dalton and Daily (1999) suggest, that the increased control and monitoring should increase shareholder value. However, while independent board members can in fact be materially independent in their obligations, they can still be influenced and affected by management. In smaller companies it is often the case that the CEO is a board member, effectively breaching this separation. While the CEO would indeed not be classified as independent from the company, he could still influence the remaining board of directors. The independence from company variable is instrumental in capturing the separation

between owners and management. While its effect on underpricing is statistically insignificant and with an implied positive relationship, investigating the relationship of board independence from company with financial returns as a benchmark could perhaps have shed more light on this phenomenon.

Independence from owners shows a positive coefficient of *0.113*, seen in *Table 7,* with no statistical significance. This also contradicts the formulated hypothesis. This implies that higher independence in the board increases the underpricing of the IPO. The positive sign was not expected as independence in the board could signal a fairer valuation of the company and no conflict of interests in the firm's board of directors. Furthermore, this is not in line with what Rashid (2014) suggests, that the decrease in agency costs should increase shareholder value. The implications of having board members that are independent from the owners should act as protection for minority shareholders. In Sweden, with its prominently high ownership concentration, having ownership independence in the board of directors would seem crucial. This would have a protective effect on stockholders and provide less biased decision making. Therefore, investor should perceive it as a positive signal and the underpricing of the IPO should therefore decrease. What is interesting here is the difference between the enforceable Aktiebolagslagen and the soft law guidelines of the Swedish Corporate Governance Code. While Aktiebolagslagen enforces biases and conflicting interests that the board members might have with a third party through more extensive requirements, it does not regulate any form of disclosures on a pre-emptive state regarding possible biases that the individual board member might have. Should the disclosure of ownership independence become more enforceable, the market might value this measure higher.

6.4 Interaction terms

The three interaction variables for *Diversity* and *Independence*, *Independence from company* and Independence *from owners* are described in *Table 8*. The interaction term for *Diversity* and *Independence* has a negative coefficient of *-0.433* but lacks statistical significance. While the variable has a negative coefficient, it is not statistically significant and little can be said about the effect. While there was statistical significance for the *Independence* variable, the coefficient is

larger than in previous regressions. Since the interaction term is not statistically significant, the hypothesis is not supported.

The *Diversity and Independence from company* variable has no statistical significance with a positive coefficient of *0.017* and the hypothesis cannot be attested. The positive effect seen from *Diversity and Independence from company* was not predicted as having both board diversity and independence from owners was expected to have signalling effects that would lower the underpricing.

The variable *Diversity and Independence from owners* has a negative coefficient of *-0.555* with weak statistical significance which implies a negative relationship with underpricing. There is an interaction effect between *Diversity and Independence from owners* which supports the third hypothesis. It is however only weakly statistically significant albeit it supports the hypothesis of an interaction effect. The hypothesis is supported with weak statistical significance and thus supports the hypothesis of an interaction effect between *Diversity* and *Independence from owners*.

What can be observed however, is that the market values not only one factor but rather a multitude of them. Having a diverse board and ownership independence illustrates the importance of this. It could also perhaps be a sign of a board that is more dedicated to their monitoring and decision making responsibilities and by that avoiding issues such as groupthink. As discussed before, including more variables on board characteristics could enhance the significance of the interaction terms. With the inclusion of more variables more interaction terms could have been investigated. It is also expected that these variables will have more impact in the future when the investors should value these factors even more than they do today.

6.5 Controls

The variable *Pre-money* shows negative coefficient of *-0.042*, which could indicate that there is a negative relationship present, despite our results not being statistically significant, seen in *Table 6*. This would imply that there is a negative relationship between underpricing and pre-money valuation. This aligns with the theory that a higher valued, and thus, large, firm would have less

underpricing due to it being monitored to a higher degree than others, thus have lower degree of information asymmetry and risk. Even though the negative sign is consistent throughout the initial regressions as well as in the final regression model, there is a certain robustness about the negative sign, despite it not being statistically significant.

Board Size lacks statistical significance but shows a positive coefficient of *0.183,* seen in *Table 6*. This would suggest a positive relationship to underpricing. It could be interpreted as a proxy for firm management, meaning more members in the board of directors would suggest better firm management and less information asymmetry, which would result in less underpricing. This could however also imply that a larger board increases underpricing, perhaps due to inefficiency. The sign is also consistent, showing positive coefficients throughout the regressions, indicating robustness. The positive sign could be explained by the upper echelon theory and suggests that having bigger boards is perceived as less efficient than smaller boards.

The variable *Firm Age* shows a positive coefficient of *0.002* with statistical significance, seen in *Table 6*. This is not in line with what was expected as an older, and thus more mature, company should possess less information asymmetry and risk which should have a decreasing effect on underpricing (Chapple & Humphrey, 2013). The positive coefficient is consistent in the entirety of the regressions, indicating robustness. Furthermore, the statistical significance of 5 % is present in many of the regressions and the coefficient sees little change, once again indicating robustness.

Gender Chair shows a negative coefficient of *-0.192* with statistical significance, seen in *Table 6*. This would imply that having a female as chairmen of the board of directors would reduce underpricing, partially mitigating the information asymmetry problem which is in line with what both Leland and Pyle (1977). While chairman of the board is a respected and prestigious position, unlike other countries, the power within that position is limited in Sweden. Since no formal power apart from having the final casting vote in board decisions, the role of the chairmen of the board is more directed towards leading and documenting the boards procedures and monitoring (Aktiebolagslagen, 2005). While certain executive powers could be prevalent, such as deciding on topics of discussion could warp the direction of the board, the executive power still remains in the hands of the board. The negative relationship between having women as the chairman of the board

on underpricing could come from the signalling effect. As presented by Bilimoria (2002), companies can signal sound governance by promoting women to higher positions, such as directors of the board. Furthermore, since females in many cases exhibit greater risk averseness and better monitoring capabilities than men, it also transmits signals of a high-value board in an attempt to reduce information asymmetry when firms go public (Bel-Oms et al., 2017, Miller et al., 1999). This would have a positive effect on the performance of the company, thus decrease underpricing. This is also in line with the women on boards theory which connects to the resource dependency theory and agency theory.

CEO Gender shows a positive coefficient of *0.068*, however with no statistical significance, seen in *Table 6.* This suggests that having a female as CEO should increase the underpricing. The coefficient implies that despite female diversity is an academically proven to be profitable, the market would still value males in the role of CEO. The reason might be that investors find the role of the chairman of higher importance and thus a stronger indicator of the firm's future performance.

Stock Exchange shows a positive coefficient of *0.056* with no statistical significance, seen in *Table 6.* This is not in line with expectations as listings on Nasdaq Stockholm were expected to have less underpricing than listings on Nasdaq First North. The average underpricing for listings on Nasdaq Stockholm 10.0 % was while it was 9.7 % on Nasdaq First North. However, the total average amount of underpricing was in line with what was expected. Lastly, the different control dummies for industries showed no statistical significance and they showed both positive and negative coefficients which were expected.

7. Conclusion, discussion and further research

7.1 Conclusion

A positive relationship was found between board diversity and IPO underpricing with no statistical significance. However, firm age showed a significant positive relationship and the gender of the chairman showed a significant negative relationship to underpricing. While little can be concluded from the effects of board diversity and independence on IPO underpricing, the signalling effect might still be present. Interference with other types of characteristics not captured in the model such as personal traits of executives and board members and education might entail a clearer picture of what signals are valued by investors than only the gender of the board member. Solely having a gender diverse board of directors would according to this paper not result in less underpricing. This would indicate that more traits are sought after than simply gender diversity. A weakly statistically significant relationship was found between *Independence* and *Underpricing,* suggesting a positive relationship. However, when interacting *Diversity* with *Independence*, no statistical significant effect was found. Despite supporting evidence of the effects of board independence exist in academia, no conclusion can be drawn from this study. Statistical significance was found for the interaction term between *Independence from company* and *Diversity*, suggesting that there is an interaction effect between the two on IPO underpricing.

7.2 Discussion and further research

The lack of statistical significance for the main independent variable could be due to the small sample size of 188. Only 22 % of the companies in the sample were considered having diverse boards and there were few female CEOs and as chairmen of the boards. This can be downside of using a dummy variable since using a percentage could have given a better result. A larger sample could have included more companies with diverse boards and could thus have rendered more precise results. Moreover, for every year, the percentage of companies with diverse boards should increase, which makes this research area interesting to follow.

Other types of diversity apart from gender could have been added to the personal characteristics of the board members in order to shed light on other types of diversity. These could have included

different education, social status, area of residence, ethnic background and age. These could have captured personal competence which also constitutes a signalling value. Having diversity is in many ways a mean to avoid groupthink. Groupthink is troublesome phenomenon to measure, not the least to perform studies on. Gender diversity certainly can solve some types of groupthink but most likely not all. Having a broader definition of diversity than just gender would help in this endeavour; possibly culminating in a more effective board with regards to monitoring and decision making.

Sweden is a unique country when it comes to ownership concentration as there are a few wealthy families spread over different institutional owners. These include the Wallenberg-sphere through Investor and Stenbeck through Kinnevik. This high level of ownership concentration could have implications for the importance of having ownership independence while performing the IPO since it would reduce agency costs and act as protection for smaller investors against larger shareholders with the intent to expropriate wealth and possible risk-shifting. While different studies examine the impact of board independence, little research exist on the separation of board independence into owner independence and company independence. This topic should be further investigated, beyond the scope of IPO underpricing.

While the board of directors have an impact on the overall impression of the firm, it would be of interest to determine whether or not this diversity truly is reflected throughout the company. More specific details about the chairman of the board could have been of interest. This could entail whether there were any reasons as to why the listing was more or less underpriced. In general, more board characteristics could be investigated in relation to IPO underpricing such as more variables on diversity. Furthermore, financial variables could be included such as leverage and ROA as well as variables concerning the ownership of the company, e.g. PE/VC-ownership and institutional ownership. Lastly, further research could be done on a broader sample, by expanding the timeline and including more markets than only Nasdaq Stockholm and Nasdaq First North.

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9. Appendices

9.1 Figures

Figure 1. Underpricing dispersion
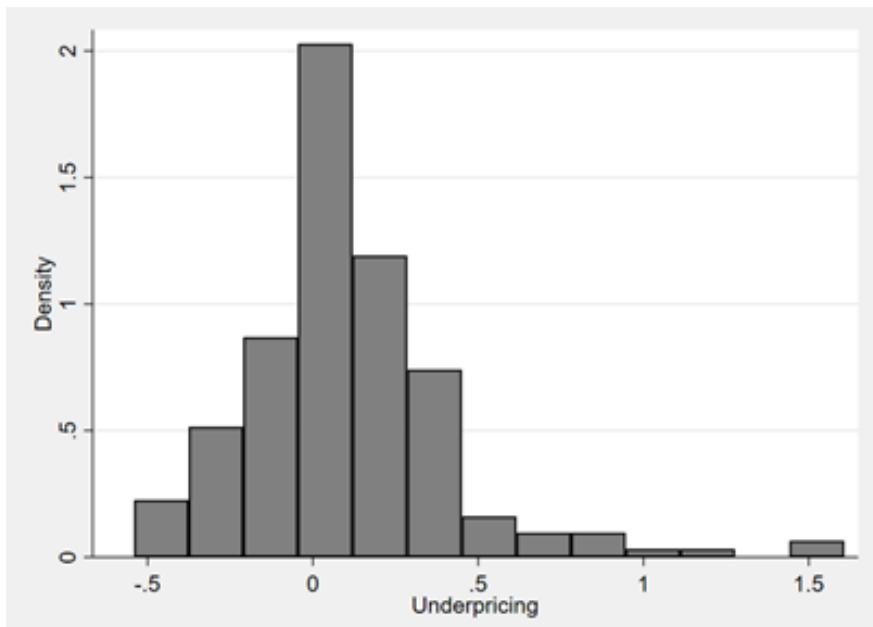
Histogram showing the dispersion of the dependent variable Underpricing

Figure 2. Diversity dispersion
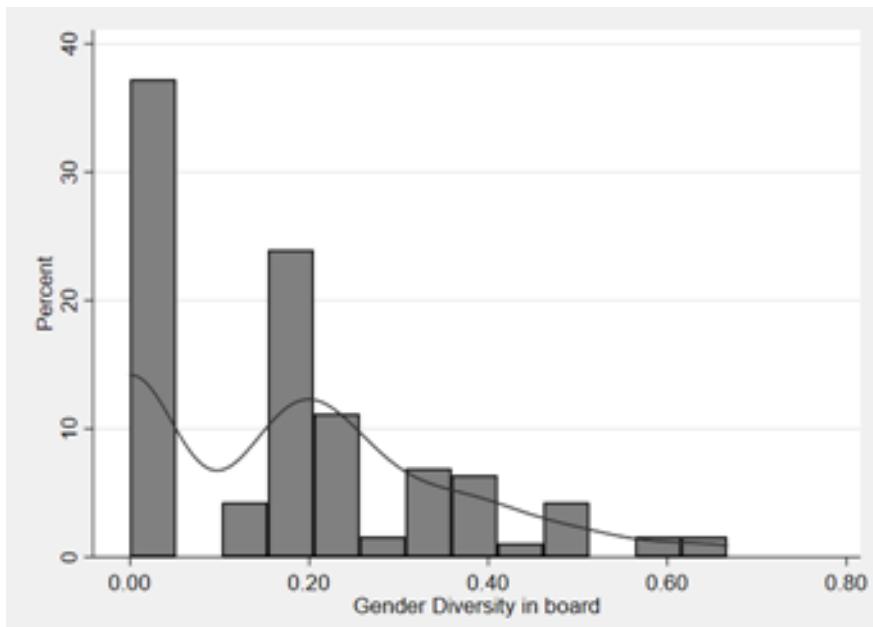
Histogram showing the dispersion in percentage of the variable Diversity.

Figure 3. Independence from company dispersion
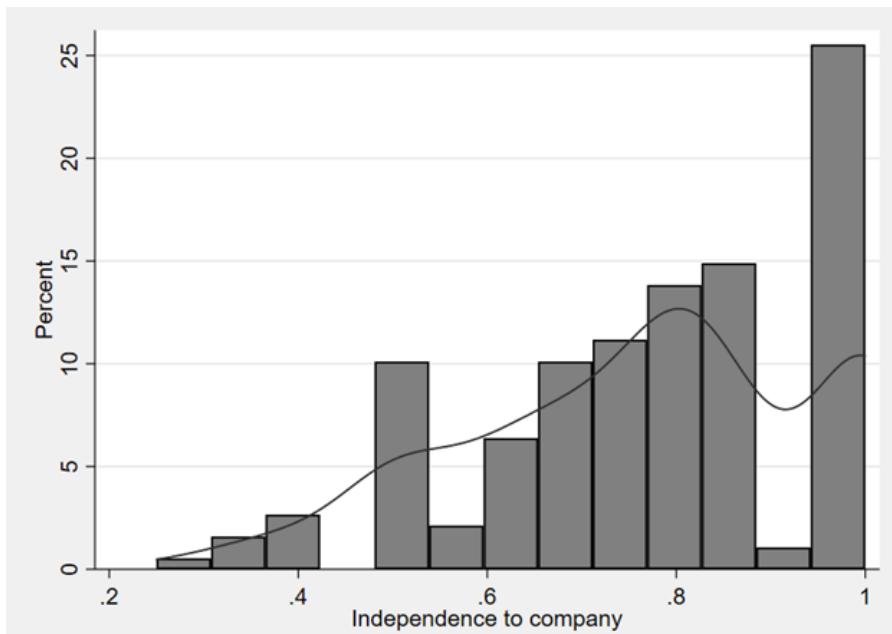
Histogram showing the dispersion of the explanatory variable Independence from company

Figure 4. Independence from owners dispersion
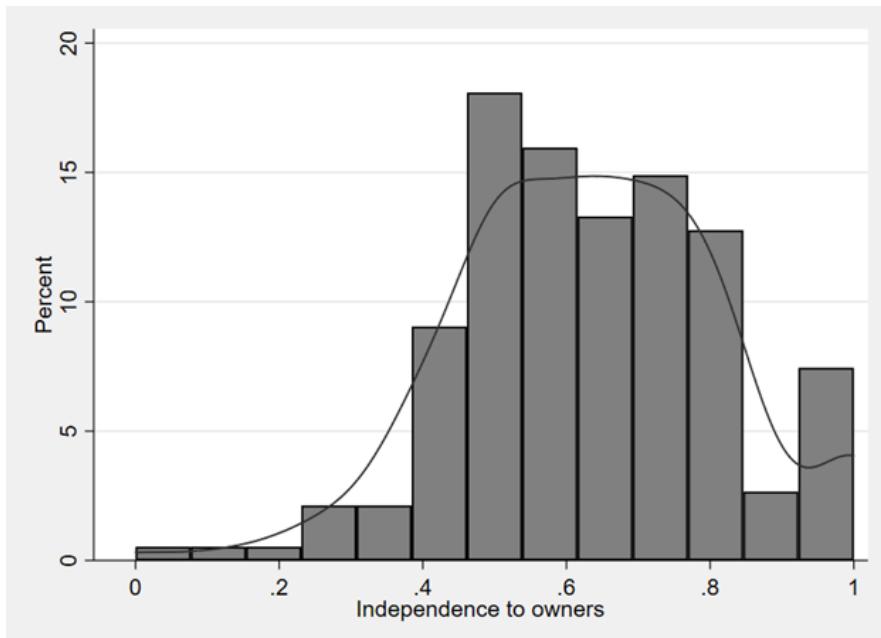
Histogram illustrating the dispersion of the explanatory variable Independence from owners.

Figure 5. Plotted residuals
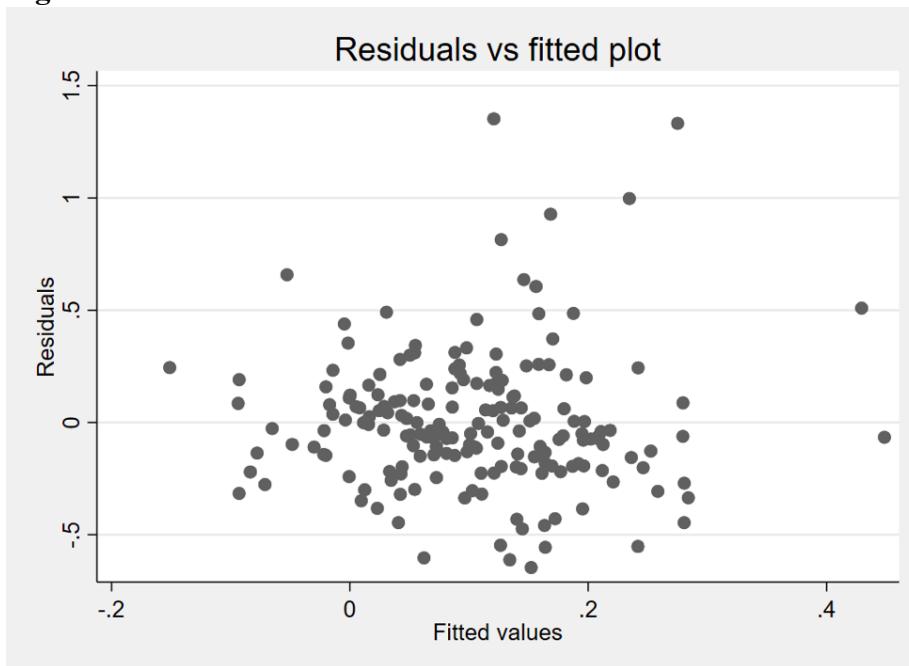
Figure illustrating the plotted fitted residuals from Regressions. Heteroskedastic tendencies can be observed.

Figure 6. Diversity characteristics
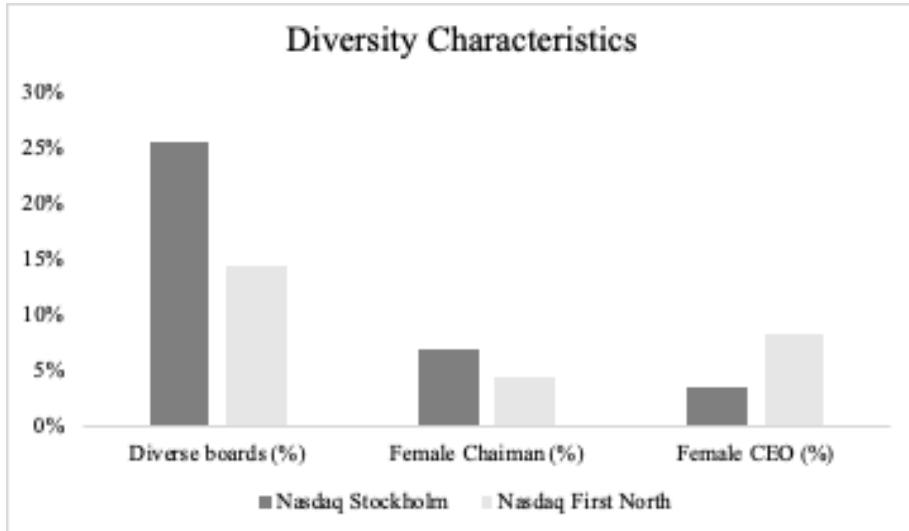
These graphs show the percentage of diverse boards, female chairmen and female CEOs on Nasdaq Stockholm and Nasdaq First North.

Figure 7. Degree of Independence

Degree of Independence
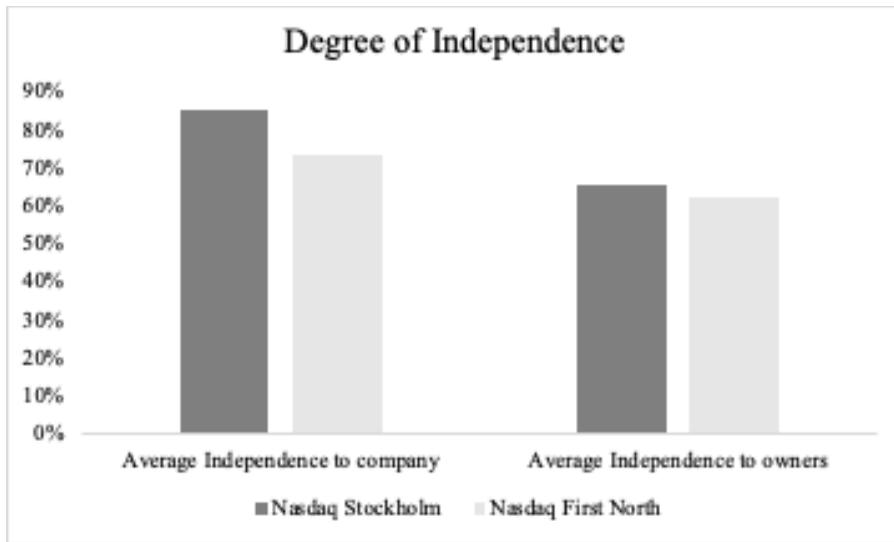
These graphs show the average independence from company and average independence from owners on Nasdaq Stockholm and Nasdaq First North.

9.2 Tables

Table 1. Variable definitions and sources

Variable	Definition	Source
Underpricing	The difference, in percentage, between offer price and first day closing price	Bloomberg Historical and manually retrieved from IPO prospectus
Diversity	If the board consist of between 30 - 70 % women	Manually retrieved from IPO prospectus
CEOgender	1 if the CEO is female	Manually retrieved from IPO prospectus
Chairgender	1 if the CEO is female	Manually retrieved from IPO prospectus
Independence from owners	Defined by the Swedish Corporate Governance Code	Manually retrieved from IPO prospectus
Independence from company	Defined by the Swedish Corporate Governance Code	Manually retrieved from IPO prospectus
Pre-money valuation	The valuation of the company prior to the IPO	Bloomberg Historical and manually retrieved from IPO prospectus
Board Size	The number of board members	Manually retrieved from IPO prospectus
Firm Age	The age of the company prior to the IPO	Manually retrieved from IPO prospectus
Primary Exchange	1 if the company is listed on Nasdaq Stockholm	Manually retrieved from IPO prospectus
Year	The year of the listing	Bloomberg Historical
Industry	Industry classification according to the Global Industry Classification Standard (GICS)	Capital IQ

The table above shows the variables, their definition and their sources.

Table 2. Descriptive Statistics

Variable	N	Mean	Median	SD	Min	Max
Underpricing	188	0.100	0.06	0.320	-0.540	1.610
Diversity	188	0.220	0	0.410	0	1
Merged Independence	188	0.700	0.70	0.150	0.170	1.000
Independence from company	188	0.770	0.80	0.190	0.250	1
Independence from owners	188	0.630	0.63	0.190	0	1
ChairGender	188	0.050	0	0.230	0	1
CEOgender	188	0.070	0	0.250	0	1
Pre-money valuation	188	1184	251	2283	18.8	19305
Board size	188	5.300	5	1.250	2	9
Firm age	188	18.090	12	21.330	2	152
Stock Exchange	188	0.300	0	0.460	0	1

This table describe the statistics for all the included variables, in levels, for the sample of 188 IPOs. It shows the sample size (n), the average in the sample (mean), the standard deviation (S.D.), the min, max and median. Further description of the variables can be found in section 5 "Data and Descriptive Statistics".

Table 3. Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Underpricing	1.000									
(2) Diversity	0.001	1.000								
(3) Independence from c	0.098	0.141	1.000							
(4) Independence from o	0.081	0.042	0.248	1.000						
(5) ChairGender	-0.081	0.219	0.026	-0.093	1.000					
(6) CEOgender	0.063	0.211	0.018	-0.123	0.029	1.000				
(7) Pre-money valuation	0.010	0.039	0.182	0.019	0.032	-0.067	1.000			
(8) Board size	0.120	-0.108	0.120	-0.072	0.076	-0.066	0.372	1.000		
(9) Firm age	0.124	0.151	0.160	0.041	0.215	0.007	0.447	0.222	1.000	
(10) Stock Exchange	0.010	0.184	0.296	0.091	0.050	-0.089	0.594	0.239	0.322	1.000

This matrix shows the correlation between the variables used in the final regression. For further information regarding the variables see section 5 "Data and Descriptive Statistics".

Table 4. Summary statistics

Nasdaq Stockholm

Variable	N	Mean	Median	SD	Min	Max
Pre-money valuation	57	3234	1966	3280	204	19305
Board size	57	5.8	6	1.4	2	9
Firm age	57	28.5	17	31.8	4	152
Chairgender	57	0.07	0	0.258	0	1
CEOgender	57	0.035	0	0.186	0	1

Nasdaq First North

Variable	N	Mean	Median	SD	Min	Max
Pre-money valuation	131	292	150	465	18.8	3485
Board size	131	5.1	5	1.1	3	9
Firm age	131	13.5	10	12.3	2	83
Chairgender	131	0.046	0	0.21	0	1
CEOgender	131	0.084	0	0.278	0	1

This table describes de summary statistics divided on Nasdaq Stockholm and Nasdaq First North. Included in the table is the number of observations (N), mean, median, standard deviation (SD), min and max.

Table 5. Diagnostic tests

Test:	Breusch-Pagan	White's test	Ramsey RESET
Variables:	Error terms	Error terms	Variables
H_0	Constant variance	Homoskedasticity	Model has no omitted variables
chi2(1) =	18.19	96.88	0.39
Prob > chi2 =	0.0000	0.7017	0.7597
Result	H_0 can be rejected on desired statistical significance.	H_0 cannot be rejected on desired statistical significance.	H_0 cannot be rejected on desired statistical significance.

The table above shows the diagnostic tests and their results.

Table 6. Regression 1

VARIABLES	R1	R2	Model 1
Diversity	0.0131	0.0131	0.00940
	(0.0629)	(0.0485)	(0.0515)
Chair Gender	-0.192*	-0.192***	-0.190**
	(0.112)	(0.0718)	(0.0741)
CEO Gender	0.0680	0.0680	0.0700
	(0.0956)	(0.104)	(0.103)
Pre-money valuation	-0.0418	-0.0418	-0.0412
	(0.0272)	(0.0283)	(0.0293)
Board size	0.183	0.183	0.184
	(0.111)	(0.120)	(0.122)
Firm age	0.00237*	0.00237**	0.00230**
	(0.00123)	(0.000947)	(0.00101)
Stock exchange	0.0557	0.0557	0.0545
	(0.0845)	(0.0633)	(0.0683)
Year 2015			-0.00530
			(0.0774)
Year 2016			0.0165
			(0.0721)
Year 2017			0.0235
			(0.0780)
Constant	0.0124	0.0124	0.00416
	(0.252)	(0.215)	(0.241)
Controls for Industry	**Yes**	**Yes**	**Yes**
Robust	**No**	**Yes**	**Yes**
Observations	188	188	188
R-squared	0.061	0.061	0.063
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

*Regression illustrating the relationship between Underpricing and Diversity. Control variables are included. R1 is performed with standard errors but after tests for heteroskedasticity, robust standard errors are used. Yearly effects are also added in **Model 1**.*

Table 7. Regression 2

VARIABLES	R1	Model 2	R2	R3
Independence	0.217*	0.217*		
	(0.122)	(0.124)		
Independence from company			0.103	0.105
			(0.131)	(0.135)
Independence from owners			0.113	0.113
			(0.120)	(0.121)
Chair Gender	-0.176***	-0.176**	-0.175**	-0.175**
	(0.0673)	(0.0695)	(0.0680)	(0.0705)
CEO Gender	0.0785	0.0793	0.0790	0.0798
	(0.112)	(0.111)	(0.110)	(0.109)
Pre-money valuation	-0.0396	-0.0393	-0.0396	-0.0393
	(0.0279)	(0.0289)	(0.0279)	(0.0288)
Board size	0.182	0.184	0.183	0.185
	(0.121)	(0.123)	(0.125)	(0.128)
Firm age	0.00227**	0.00219**	0.00227**	0.00219**
	(0.000906)	(0.000952)	(0.000908)	(0.000954)
Stock exchange	0.0381	0.0368	0.0385	0.0371
	(0.0643)	(0.0682)	(0.0670)	(0.0705)
Year 2015		-0.00747		-0.00721
		(0.0741)		(0.0745)
Year 2016		0.0164		0.0167
		(0.0716)		(0.0726)
Year 2017		0.0234		0.0235
		(0.0768)		(0.0767)
Constant	-0.145	-0.153	-0.146	-0.155
	(0.224)	(0.240)	(0.224)	(0.240)
Controls for Industry	**Yes**	**Yes**	**Yes**	**Yes**
Observations	188	188	188	188
R-squared	0.070	0.072	0.070	0.072

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regression showing the relationship between *Underpricing* and *Independence, shown in **Model 2**. Independence is thereafter divided into two categories, Independence from company and Independence from owners. Yearly effects are added. Regressions are done with robust standard errors and control for industry.*

Table 8. Regression 3

VARIABLES	R1	Model 3.1	Model 3.2	Model 3.2
Diversity	0.324	0.316	-0.00596	0.377*
	(0.263)	(0.271)	(0.232)	(0.223)
Independence	0.287**	0.288**		
	(0.137)	(0.143)		
Interaction Independence Diversity	-0.433	-0.427		
	(0.332)	(0.344)		
Independence from company			0.129	
			(0.135)	
Interaction Independence from company and Diversity			0.0168	
			(0.273)	
Independence from owners				0.242**
				(0.111)
Interaction Independence from owners and Diversity				-0.555*
				(0.317)
Chair Gender	-0.193**	-0.191**	-0.191***	-0.215**
	(0.0780)	(0.0802)	(0.0725)	(0.0840)
CEO Gender	0.0601	0.0605	0.0667	0.0431
	(0.101)	(0.101)	(0.105)	(0.0942)
Pre-money valuation	-0.0443	-0.0444	-0.0405	-0.0479*
	(0.0286)	(0.0297)	(0.0287)	(0.0284)
Board size	0.175	0.175	0.174	0.174
	(0.123)	(0.125)	(0.123)	(0.120)
Firm age	0.00232**	0.00226**	0.00230**	0.00227**
	(0.000923)	(0.000970)	(0.000948)	(0.000907)
Stock exchange	0.0504	0.0510	0.0396	0.0721
	(0.0640)	(0.0686)	(0.0687)	(0.0619)
Year 2015		-0.0120		
		(0.0776)		
Year 2016		0.00578		
		(0.0731)		
Year 2017		0.0193		
		(0.0772)		
Constant	-0.148	-0.142	-0.0621	-0.0764
	(0.227)	(0.243)	(0.219)	(0.225)
Controls for Industry	**Yes**	**Yes**	**Yes**	**Yes**
Observations	188	188	188	188
R-squared	0.076	0.077	0.066	0.083
	Robust standard errors in parentheses			
	*** $p<0.01$, ** $p<0.05$, * $p<0.1$			

*The regression showing the relationship between Underpricing, Diversity and Independence. An interaction variable between Diversity and Independence is created, shown in **Model 3.1**. Subsequently, the two forms of Independence are also interacted with Diversity in **Model 3.2**. Regressions are done with robust standard errors and control for industry.*